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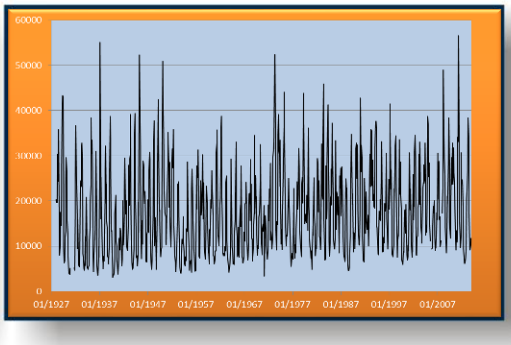
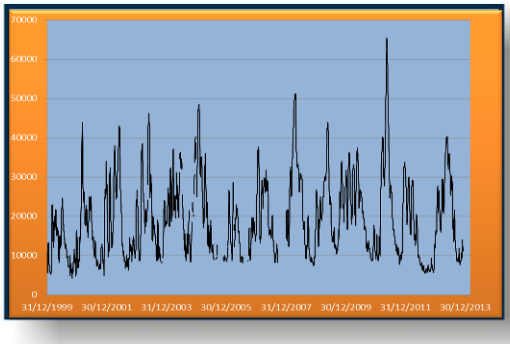
CSIR Contribution to Defining Adaptive Capacity in the Context of Environmental Change

1st Interim Report





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CSIR Contribution to Defining Adaptive Capacity in the Context of Environmental Change

1st Interim Report

Report prepared for:
ERDC-IRO
ATTN: Julian Richmond
86-88 Blenheim Crescent
West Ruislip
Middlesex, HA4 7HL
United Kingdom

Report prepared by:
Marius Claassen & Karen Nortje
CSIR
PO Box 395
Pretoria
0001, South Africa

Date:
31 March 2014

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1. INTRODUCTION

The grant (W911NF-14-1-0113) is based on the premise that human security and environmental security is inextricably linked and that a better understanding the relationship between human and environmental security will assist in reducing vulnerabilities and improving stability. The grant supports CSIR and ERDC research in adaptation to water-related impacts of climate change. The grant supports a comparison of historic human responses to environmental change in the Mississippi River and the Nile River, as measured by human security indicator datasets and environmental variability data. The overall goal is to measure regional adaptive capacity and thus understand how to facilitate regional stability that can withstand threats imposed by environmental impacts. Based on the outcome of this analysis, a set of metrics will be developed that will assist in measuring the adaptive capacity of a region based on past behaviour and capabilities to cope with physical or environmental changes.

The research is focused on understanding and identifying vulnerabilities in developing regions that inherently have fewer institutional capabilities to handle large-scale changes. The qualitative and quantitative analysis of adaptive capacity compares areas in the Mississippi and Nile Basin. The Mississippi case area serves as a more controlled case study with the Nile Basin representing a context with more limited historical data. Environmental change and human behavior over the hundred year time scale (1910-2010) are being used for the analysis. The comparison of environmental change (eg. precipitation and temperature trends) and the corresponding human behavioural responses (eg food access and migration patterns) will provide an input to metric creation, contingent on evidence that changes in local stability are related to environmental change. These metrics will be used to measure areas of vulnerability within both study regions.

2. PROJECT TASKS AND PROGRESS

2.1 Tasks

No.	Task	Description	Target date
1	Datasets	1.1 Inputs to environmental and human security datasets	31 Jan 2014
2	Data fusion	2.1 Data overlay	31 March 2014
2	Data fusion	2.2 Data analysis 2.3 Additional data collection	30 Sept 2014
3	Correlation	3.1 Compare results	30 Sept 2014
4	Metrics	4.1 Develop adaptive capacity metrics	31 March 2015
4	Metrics	4.2 Identify areas of vulnerability	30 June 2015

This report pertains to Task 1: Data Sets. The Tasks has been described as follows in the Project Plan:

Task 1: Data collection:

Task 1.1: (a) Gather and create environmental variability datasets from meteorological and hydrological observations for the time period (1910-2010) for both the Mississippi River and the Nile River. Meteorological data over the research areas will be gathered from Global Historical Climatology Network (GHCN) maintained by NOAA, 14th Operational Weather Squadron, the National Climatic Data Center (NCDC), along with the additional data sources listed in Table 3 and other data sources as provided by CCAPS. Data will then be combined from these sources to create a comprehensive database for each research area. ***The CSIR will assist with the data gathering, specifically for the Nile Basin and selected sub-region****.*

Task 1.1: (b) Depending upon the database created, a partnership may be formed within ERDC, DoD, or academic community in order to facilitate provision of or creation of a reanalysis dataset. Use of a re-analysis dataset will depend upon information gathered in Task 1.2.

Task 1.2: Build a composite human security indicator dataset from the Global Human Security Index in conjunction with the other socio-economic and general population data tabulated above from 1910-2010 for both the Mississippi River and the Nile River. ***The CSIR team will contribute data to this task, which will be integrated into the dataset. All data will be combined and assessed using a mixed methods approach composed of both a historical analysis and a longitudinal study.***

2.2 Progress

Task 1.1a

The CSIR team conducted a broad survey of qualitative and quantitative data for the Nile and Mississippi case areas. Hydrological data was acquired from the Global Runoff Data Centre. The data includes average daily and monthly flow for the Mississippi River and Monthly average flows for the Nile River. The available data is summarised as follows:

River	Station	lat	long	d_start	d_end
ST. CROIX RIVER (TRIB. MISSISSIPPI)	ST. CROIX FALLS, WI	45.407	-92.65	1902	2013
MISSISSIPPI RIVER	ST.PAUL, MN	44.934	-93.11	1892	2012
MISSISSIPPI RIVER	AITKIN, MN	46.541	-93.71	1945	2013
GREEN RIVER (TRIB. UPPER MISSISSIPPI)	NEAR GENESEO, IL	41.489	-90.16	1936	2013
CEDAR RIVER (TRIB. MISSISSIPPI)	CEDAR RAPIDS, IA	41.971	-91.67	1902	2013
CEDAR RIVER (TRIB. MISSISSIPPI)	WATERLOO, IA	42.496	-92.33	1940	2013
CEDAR RIVER (TRIB. MISSISSIPPI)	JANESVILLE, IA	42.648	-92.47	1904	2013
CEDAR RIVER (TRIB. MISSISSIPPI)	CHARLES CITY, IA	43.063	-92.67	1964	2013
CEDAR RIVER (TRIB. MISSISSIPPI)	NEAR CONESVILLE, IA	41.41	-91.29	1939	2013
SALT RIVER (TRIB. MISSISSIPPI)	NEAR NEW LONDON, MO	39.612	-91.41	1922	2013
MISSISSIPPI RIVER	KEOKUK, IA	40.394	-91.37	1878	2013

FOX RIVER (TRIB. MISSISSIPPI)	DAYTON, IL	41.385	-88.79	1914	2013
VERMILION RIVER (TRIB. MISSISSIPPI)	NEAR LEONORE, IL	41.208	-88.93	1931	2013
SALT CREEK (TRIB. MISSISSIPPI)	NEAR GREENVIEW, IL	40.132	-89.74	1941	2013
ILLINOIS RIVER (TRIB. UPPER MISSISSIPPI)	VALLEY CITY	39.703	-90.65	1938	2013
ILLINOIS RIVER (TRIB. UPPER MISSISSIPPI)	HENRY, IL	41.107	-89.36	1981	2013
BLACK RIVER (TRIB. MISSISSIPPI)	NEAR GAILSVILLE, WI	44.06	-91.29	1931	2013
BLACK RIVER (TRIB. MISSISSIPPI)	NEILLSVILLE, WI	44.56	-90.62	1905	2013
CHIPPEWA RIVER (TRIB. MISSISSIPPI)	DURAND, WI	44.628	-91.97	1928	2013
CHIPPEWA RIVER (TRIB. MISSISSIPPI)	CHIPPEWA FALLS, WI	44.927	-91.41	1888	2013
CHIPPEWA RIVER (TRIB. MISSISSIPPI)	NEAR BRUCE, WI	45.452	-91.26	1913	2013
MISSISSIPPI RIVER	CLINTON, IA	41.781	-90.25	1873	2013
MISSISSIPPI RIVER	ALTON, ILL.	38.885	-90.18	1933	1987
WHITE RIVER (TRIB. MISSISSIPPI)	DEVALLS BLUFF, AR	34.79	-91.45	1949	2013
WHITE RIVER (TRIB. MISSISSIPPI)	NEWPORT, AR	35.605	-91.29	1927	2013
WHITE RIVER (TRIB. MISSISSIPPI)	BATESVILLE, AR	35.76	-91.64	1937	2012
WHITE RIVER (TRIB. MISSISSIPPI)	NEAR BRANSON, MO	36.598	-93.3	1951	2009
WHITE RIVER (TRIB. MISSISSIPPI)	NEAR FAYETTEVILLE, AR	36.073	-94.08	1963	2013
MISSISSIPPI RIVER	NEAR ARKANSAS CITY, ARK	33.558	-91.24	1928	1980
MISSISSIPPI RIVER	THEBES, IL	37.217	-89.46	1933	2013
MISSISSIPPI RIVER	CHESTER, IL	37.903	-89.84	1942	2013
MISSISSIPPI RIVER	ST. LOUIS, MO	38.629	-90.18	1880	2013
MISSISSIPPI RIVER	VICKSBURG, MS	32.315	-90.91	1931	2013
MISSISSIPPI RIVER	TARBERT LANDING, MS	31.009	-91.62	1982	1991
MISSISSIPPI RIVER	RED RIVER LANDING AT SIMMESPORT	30.983	-91.8	1928	1964

The data for the Nile River includes mean monthly flows, with the following details:

river	station	lat	long	m_start	m_end
NILE	EL EKHSASE	29.7	31.28	1973	1984
NILE	DONGOLA	19.18	30.48	1912	1984
NILE	HUDEIBA + HASSANAB	17.65	33.65	1908	1982
NILE	ASSIUT	27.18	31.1	1973	1984
NILE	NAG HAMMADI	26.05	32.25	1973	1984
NILE	ESNA	25.32	32.56	1973	1984
NILE	TAMANIAT	15.95	32.63	1911	1982
NILE	GAAFRA	24.32	32.9	1973	1984
NILE	ASWAN DAM	23.96	32.9	1869	1984
BLUE NILE	KHARTOUM	15.62	32.55	1900	1982
BLUE NILE	SUDAN BORDER	11	35	1969	1975
BLUE NILE	SENNAR	13.55	33.47	1912	1982
BLUE NILE	NEAR MERAWI	11.37	37.03	1978	1980
BLUE NILE	NEAR THE LAKE TANA	10	37	1969	1975
BLUE NILE	KESSIE	11.07	38.18	1976	1979
BLUE NILE	ROSEIRES DAM	11.85	34.38	1912	1982
VICTORIA NILE	PAARA	2.28	31.57	1948	1970
VICTORIA NILE	MBULAMUTI	0.82	33.03	1973	1979
VICTORIA NILE	OWEN RESERVOIR	0.47	33.12	1973	1982
VICTORIA NILE	JINJA	0.43	33.2	1946	1970
ALBERT NILE	PANYANGO	2.65	31.65	1948	1970
WHITE NILE	MOGREN	15.6	32.55	1973	1982
WHITE NILE	DOWNSTREAM OF JEBEL AULIA DAM	15.23	32.5	1973	1982
WHITE NILE	MELUT	10.43	32.2	1973	1982

WHITE NILE	MALAKAL	9.58	31.62	1912	1982
WHITE NILE	ABU TONG	9.46	31.12	1973	1982
WHITE NILE	MALEK	6.07	31.6	1973	1982
WHITE NILE	MONGALLA	5.2	31.77	1912	1982

Task 1.1b

The ERDC together with the CSIR developed a composite human security indicator dataset using the Global Human Security Index as a basis from which to work. The Global Human Security Index has at its core seven categories that are made up of a number of sub-categories. The main categories are: economic, health, personal, community, political food and environmental.

Taking the contextual nuances of the two case study areas, the Mississippi River and the Nile River, into consideration, the team (CSIR and ERDC) developed a new dataset which comprises of the following main categories: economic, health, personal, community, political, food, environmental, cultural/spiritual, physical infrastructure and livelihoods. Each of these categories also have sub-categories which are specifically linked to human adaptive capacity within the context of environmental change.

ECONOMIC	HEALTH TRENDS	PERSONAL	COM-MUNITY	POLITICAL	FOOD	ENVIRON-MENTAL	CULTURAL/ SPIRITUAL	PHYSICAL INFRA-STRUCTURE	LIVELI-HOODS
Status of financial system	Health trends	Fear of violence (physical torture, war, ethnic tension, suicide etc.)	Fear of multinational/multiregional conflicts	Type political institution	Availability food	Pollution rates	Cultural norms	Roads	Agricultural practises / norms
Level of Income	Access to safe water	Gender based discrimination	Fear of internal conflicts	Civil rights	Quality of nutrition	Status of environmental policies	Spiritual practises	Dams	Food for sale
Sufficiency of incomes	Access to housing: shelter from natural elements	Crime statistics	Conservation of traditional/ethnic cultures, languages and values	Human rights	Accessibility of food	Land conservation	Knowledge systems	Irrigation	Food for consumption
Types of employment	Accessibility to healthcare systems (physical and economic)	Illegal drugs	Ethnic/race relations	Regional/ national governance	Access to food during natural/ man-made disasters	Natural hazard mitigation (droughts, floods, cyclones or earthquakes)	Social network structures	Levees	
Employment rates	Accessibility to safe and affordable family	Local governance	In migration				Support structure	Other storage facilities (silos)	

	planning								
Land tenure system	Medical care	Human trafficking	Out migration				Kinship relationships		
Division of labour	Type health system	Age based discrimination	Normal migration rates				Social capital etc		
	Infant mortality	Public awarness campaigns							
	Fertility rates	Literacy rates							

These developed categories are currently being tested by using both qualitative and quantitative datasets as inputs.

2.3 What's next?

Following on from Task 1, the team will now focus on data fusion with a specific focus on the overlay of the environmental data set with the historic human indicator data.

Task 2: Data fusion

Task 2.1: Overlay the environmental dataset produced from the reanalysis with the historic human indicator data. This task will be done for both the Mississippi River and the Nile River. The CSIR will provide technical assistance with this task, which will be achieved through a joint workshop at ERDC.

3. COST AND PAYMENT SCHEDULE

3.1 Cost and Price

	Tasks	Cost items	Units	Rate	Amount (US$)	Due date
	Datasets	Karen Nortje Marius Claassen Stationary & communication	40 hrs 29 hrs	69 146	2 760 4 220 20	31 Jan 2014
		Task total			7 000	
	Data fusion (Data overlay)	Karen Nortje Marius Claassen Travel cost (visit to ERDC)	48 hrs 44 hrs	69 146	3 312 6 402 3 286	31 March 2014
		Task total			13 000	
	Data fusion (Analysis and data collection)	Karen Nortje Marius Claassen Local travel & communication	48 hrs 40 hrs	74 156	3 544 6 227 229	30 Sept 2014

		Task total			10 000	
	Correlation (Compare results)	Karen Nortje Marius Claassen Travel cost (visit to case study area)	56 hrs 48 hrs	74 156	4 134 7 473 3 393	30 Sept 2014
		Task total			15 000	
				Subtotal for year 1	45 000	
	Metrics (Adaptive capacity metrics)	Karen Nortje Marius Claassen Local travel & communication	48 hrs 40 hrs	74 156	3 544 6 227 229	31 March 2015
		Task total			10 000	
	Metrics (Areas of vulnerability)	Karen Nortje Marius Claassen Local travel & communication	24 hrs 20 hrs	74 156	1 772 3 114 114	30 June 2015
		Task total			5 000	
				Subtotal for year 2	15 000	
				Total amount requested from ERDC	60 000	

3.2 Payment schedule

Invoices will be generated as per the deliverable dates based on approval of deliverables and transfers should be within 30 days of invoice receipt